

WHAT IS CLAIMED IS:

1 1. A method to control the post sinter dimensions of a multilayer ceramic
2 substrate sintered under load comprising the steps of:

3 providing at least one first continuous non-densifying structure (40);

4 providing at least one personalized ceramic greensheet (10) having a local
5 peripheral kerf area (30) and an external peripheral kerf area (20);

6 placing said at least one first continuous non-densifying structure (40) on the local
7 peripheral kerf area (30) of said at least one personalized ceramic greensheet (10);

8 placing said at least one personalized ceramic greensheet (10) having said at least
9 one first continuous non-densifying structure (40) in a stack of personalized
10 greensheets;

11 laminating said stack of personalized ceramic greensheets to form a green ceramic
12 laminate (100) wherein said at least one first continuous non-densifying structure (40)
13 will at least partially control the dimensions of said green ceramic laminate (100) during
14 lamination;

15 sintering said green ceramic laminate (100) under load to form a multilayer
16 ceramic substrate wherein said at least one first continuous non-densifying structure
17 (40) will at least partially control the dimensions of said multilayer ceramic substrate
18 during sintering.

1 2. The method of claim 1 further comprising the step of post sinter sizing said
2 multilayer ceramic substrate thereby separating said at least one first continuous non-
3 densifying structure (40) from said multilayer ceramic substrate.

1 3. The method of claim 1 further comprising the steps of:

2 providing at least one second continuous non-densifying structure (60);

3 placing said at least one second continuous non-densifying structure (60) on the
4 external peripheral kerf area (20) of said at least one personalized ceramic greensheet
5 (10) prior to lamination wherein said at least one second continuous non-densifying
6 structure (60) will at least partially control the dimensions of said green ceramic
7 laminate (100) during lamination, and

8 pre-sinter sizing said green ceramic laminate (100) thereby separating said at least
9 one second continuous non-densifying structure (60) from said green ceramic
10 laminate (100) prior to sintering.

1 4. The method of claim 3 wherein said first and second continuous non-densifying
2 structure is metal, ceramic, polymer, or a combination thereof.

1 5. The method of claim 3 wherein said first and second continuous non-densifying

2 structure is a metal selected from the group consisting of molybdenum, nickel,
3 copper, tungsten, stainless-steel and zirconia.

1 6. The method of claim 3 wherein said first and second continuous non-densifying
2 structure has a thickness of approximately 0.0003 inch to 0.001 inch and width of
3 greater than 0.5 millimeters.

1 7. A method to control the post sinter dimensions of a multilayer ceramic
2 substrate which is laminated and sintered under load as a multi-up green ceramic
3 laminate comprising the steps of:

4 providing at least one first continuous non-densifying structure (40);

5 providing at least one personalized ceramic greensheet (10) having a plurality of
6 product samples (35) separated by a local kerf area (30) and having peripheral
7 external kerf area (20);

8 placing said at least one first continuous non-densifying structure (40) on the local
9 kerf area (30) of said at least one personalized ceramic greensheet (10);

10 placing said at least one personalized ceramic greensheet (10) having said at least
11 one first continuous non-densifying structure (40) in a stack of personalized
12 greensheets;

13 laminating said stack of personalized ceramic greensheets to form a multi-up
14 green ceramic laminate (100) wherein said at least one first continuous non-densifying

15 structure (40) will at least partially control the dimensions of said multi-up green ceramic
16 laminate (100) during lamination;
17 sintering said green ceramic laminate (100) under load to form a multi-up multilayer
18 ceramic substrate wherein said at least one first continuous non-densifying structure
19 (40) will at least partially control the dimensions of said multi-up multilayer ceramic
20 substrate during sintering.

1 8. The method of claim 7 further comprising the step of post sinter sizing said
2 multi-up multilayer ceramic substrate to form individual multilayer ceramic substrates
3 and thereby separating said at least one first continuous non-densifying structure (40)
4 from said individual multilayer ceramic substrates.

1 9. The method of claim 7 further comprising the steps of:
2 providing at least one second continuous non-densifying structure (60);
3 placing said at least one second continuous non-densifying structure (60) on the
4 external peripheral kerf area (20) of said at least one personalized ceramic greensheet
5 (10) prior to lamination wherein said at least one second continuous non-densifying
6 structure (60) will at least partially control the dimensions of said multi-up green
7 ceramic laminate (100) during lamination, and
8 pre-sinter sizing said multi-up green ceramic laminate (100) thereby separating
9 said at least one second continuous non-densifying structure (60) from said multi-up

10 green ceramic laminate (100) prior to sintering.

1 10. The method of claim 7 wherein said at least one first continuous non-densifying
2 structure (40) further comprises tailored shapes (51) to control local distortion within
3 said product samples (35).

1 11. The method of claim 9 wherein said first and second continuous
2 non-densifying structure is metal, ceramic, polymer, or a combination thereof.

1 12. The method of claim 9 wherein said first and second continuous
2 non-densifying structure is a metal selected from the group consisting of
3 molybdenum, nickel, copper, tungsten, stainless-steel and zirconia.

1 13. The method of claim 9 wherein said first and second continuous
2 non-densifying structure has a thickness of approximately 0.0003 inch to 0.001 inch
3 and width of greater than 0.5 millimeters.

1 14. A multilayer ceramic laminate structure comprising:
2 a plurality of laminated ceramic greensheets;
3 at least one personalized ceramic greensheet (10) having a local peripheral kerf

4 area (30) and an external peripheral kerf area (20);

5 at least one first continuous non-densifying structure (40) placed on said local
6 peripheral kerf area (30) of said at least one personalized ceramic greensheet (10).

1 15. The multilayer ceramic laminate structure of claim 14 further comprising:

2 at least one second continuous non-densifying structure (60) placed on said
3 external peripheral kerf area (20).

1 16. The multilayer ceramic laminate structure of claim 15 wherein said first and
2 second continuous non-densifying structure is metal, ceramic, polymer, or a
3 combination thereof.

1 17. The multilayer ceramic laminate structure of claim 15 wherein said first and
2 second continuous non-densifying structure is a metal selected from the group
3 consisting of molybdenum, nickel, copper, tungsten, stainless-steel and zirconia.

1 18. The multilayer ceramic laminate structure of claim 15 wherein said first and
2 second continuous non-densifying structure has a thickness of approximately 0.0003
3 inch to 0.001 inch and width of greater than 0.5 millimeters.

1 19. A multi-up multilayer ceramic laminate structure comprising:

2 a plurality of laminated ceramic greensheets;

3 at least one personalized ceramic greensheet (10) having a plurality of product
4 samples (35) separated by a local kerf area (30) and having peripheral external kerf
5 area (20);

6 at least one first continuous non-densifying structure (40) placed on said local kerf
7 area (30) of said at least one personalized ceramic greensheet (10).

1 20. The multi-up multilayer ceramic laminate structure of claim 19 further
2 comprising:

3 at least one second continuous non-densifying structure (60) placed on said
4 external peripheral kerf area (20).

1 21. The multi-up multilayer ceramic laminate structure of claim 19 wherein
2 said at least one first continuous non-densifying structure (40) further comprises
3 tailored shapes (51) to control local distortion within said product samples (35).

1 22. The multi-up multilayer ceramic laminate structure of claim 20 wherein said
2 first and second continuous non-densifying structure is metal, ceramic, polymer, or a
3 combination thereof.

1 23. The multi-up multilayer ceramic laminate structure of claim 20 wherein

2 said first and second continuous non-densifying structure is a metal selected from the
3 group consisting of molybdenum, nickel, copper, tungsten, stainless-steel and
4 zirconia.

1 24. The multi-up multilayer ceramic laminate structure of claim 20 wherein said
2 first and second continuous non-densifying structure has a thickness of approximately
3 0.0003 inch to 0.001 inch and width of greater than 0.5 millimeters.

1 25. The multilayer ceramic laminate structure of claim 14 further comprising:
2 discrete tailored shapes to control local distortion within the multilayer
3 ceramic laminate.